Notice of Allowability	Application No.	Applicant(s)	
	10/664,810	POOLLA ET AL.	
	Examiner	Art Unit	
	Hien X. Vo	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *application filed on 09/16/03*.

2. ☒ The allowed claim(s) is/are *1-21*.

3. ☒ The drawings filed on *16 September 2003* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 05/24/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 05/24/04. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Allowable Subject Matter

2. Claims 1-21 allowed.

3. The following is an examiner's statement of reasons for allowance:

The prior art disclose some claimed limitations.

For example, Polla et al. (U.S. Patent No. 6,738,722) discloses the method and apparatus for collecting measured parameter data for applications such as deriving response models and information required for developing and maintaining processed and process tools.

Freed et al. (U.S. Patent No. 6,691,068) methods and apparatus for collecting the data include a sensor apparatus capable of collecting data with less perturbation and fewer disruptions than is usually possible using standard methods. The sensor apparatus is capable of being loaded into a process tool. From within the process tool, the sensor

apparatus is capable of measuring data, processing data, storing data, and transmitting data. The sensor apparatus has capabilities for near real time data collection and communication.

Polla et al. (U.S. Patent No. 6,741,945) disclose the methods and apparatus are capable of deriving correction factors for the measured data and applying the corrections factors to the measure data so as to provide corrected parameter data having increased accuracy. One embodiment uses warpage geometry to derive the correction factors.

Mundt (U.S. Patent No. 6,542,835) discloses the sensors are capable of representing a measurement parameter as an electrical impedance. One embodiment of the present invention includes output electrical conductors, input electrical conductors, and sensors. Each of the sensors is connected with one of the output electrical conductors and one of the input electrical conductors so as to form an array of crosspoint connections. Application of electrical signals to the sensors and measurement of electrical signals from the sensors provide sufficient information to derive relative information from each sensor using algorithms based on equations for combining impedance. The embodiment may further include one or more reference elements connected with the output electrical conductors and with the input electrical conductors so as to form crosspoint connections.

For claim 1, the prior art does not teach singularly or in combination the step of:

B. collecting and storing non-process temperature data using the sensor apparatus with all of the at least two process parameters turned off

C. collecting and storing separate parameter process temperature data using the sensor apparatus with each of the at least two process parameters separately activated,

D. collecting and storing combined parameter process temperature data using the sensor apparatus with all of the at least Mo process parameters for processing the workpiece jointly activated, and

E. calculating the heat flux into and out of the workpiece using temperatures measured in steps B-D and intrinsic thermal properties of the workpiece.

For claims 6 and 11, the prior art does not teach singularly or in combination the step of:

A. providing target heat flux values, F_T, for heat flux into and out of the wafer for predetermined conditions,

B. making new measurements of temperatures experienced by the semiconductor wafer for the predetermined conditions;

C. deriving new heat flux values, F_N, using the temperatures from step B;

D. comparing the target heat flux, F_T, to the new heat flux, F_N, to assign a status for the process chamber so that the process chamber status is operational if F_T and F_N are substantially equal or malfunctioning if F_T and F_N are not substantially equal.

For claim 12, the prior art does not teach singularly or in combination the step of:

A. obtaining temperature measurements, T(x,y,t), representing the temperature of the workpiece in the chamber in the presence of the plasma,

B. using the temperature measurements, $T_{(x,y,t)}$, to compute the within workpiece thermal flux term $\nabla^2 T_{(x,y,t)}$ using the equation

$\nabla^2 T_{(x,y,t)}$ = Average of T over a circle of small radius centered at (x,y) - $T_{(x,y,t)}$;

C. estimating the chuck temperature, T_c , and the chuck conduction coefficients, α, for spatial co-ordinates (x,y) by determining a best fit of the temperature measurements to the equation

$$\frac{dT}{dt} = k_w \nabla^2 T - k_c \alpha (T - T_c) \text{ ; and}$$

D. computing the plasma heat flux, Φ_p , and the chuck heat flux, Φ_c , using the equations

$$\Phi_c = \alpha (T - T_c) \text{ and}$$

$$k_p \Phi_p = (dT/dt) - k_w \nabla^2 T + k_c \Phi_c \text{ .}$$

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hien X. Vo whose telephone number is (571) 272-2282. The examiner can normally be reached on M-F (8:00-5:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hien Vo
December 10, 2004

John Barlow
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Technology Center 2800